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by MATERIALS DIVISION

Propulsion and Vehicle Engineering Laboratory

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Huntsville, Alabama*

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TECHNICAL MEMORANDUM X-53191

1964 PUBLICATIONS

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ABSTRACT

"1964 Publications" is a compilation of abstracts of a NASA Technical Note, NASA Technical Memorandums, and MSFC Internal Notes, written by personnel of the Materials Division and released during 1964.

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TECHNICAL MEMORANDUM X-53191

1964 PUBLICATIONS

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Materials Division

MATERIALS DIVISION
PROPULSION AND VEHICLE ENGINEERING LABORATORY

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GEORGE C. MARSHALL SPACE FLIGHT CENTER

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N65-24950

SUMMARY

This report lists and abstracts a NASA Technical Note, NASA Technical Memorandums, and MSFC Internal Notes written by personnel of the Materials Division, Propulsion and Vehicle Engineering Laboratory, George C. Marshall Space Flight Center, National Aeronautics and Space Administration, during 1964.

Author ~~Author~~

INTRODUCTION

The mission of the Materials Division is to conduct research and development in materials science and engineering as related to the programs of the George C. Marshall Space Flight Center. This report lists and abstracts the technical reports written by personnel of the Materials Division during 1964.

Requests for copies of these reports should be addressed to:

National Aeronautics and Space Administration
George C. Marshall Space Flight Center
Huntsville, Alabama 35812
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NASA TECHNICAL NOTE

September 1964

INVESTIGATION OF S-IV ALL SYSTEMS VEHICLE EXPLOSION

NASA TN D-563

by J. B. Gayle

Unclassified, 48 pages, 5 tables, 16 figures

Investigation of the S-IV All Systems Vehicle explosion indicated the following: high explosive equivalent, 1 percent; fireball diameter, 380 feet; fireball duration, 11 seconds; maximum fragment radius, 1500 feet. The relatively low yield was due to substantially instantaneous ignition of the spilled propellants which probably resulted from the extreme flammability of hydrogen. If this trend persists in the scale model test programs now in progress, some reduction in the 60 percent high explosive equivalent currently used for siting of LOX/LH₂ vehicles may be possible.

NASA TECHNICAL MEMORANDUMS

February 3, 1964

1963 PUBLICATIONS

NASA TM X-53006

by Materials Division

Unclassified, 20 pages

"1963 Publications" is a compilation of official abstracts of Marshall Technical Papers and Internal Notes, written by personnel of the Materials Division, released during 1963.

February 3, 1964

DESTRUCT TESTS ON SCALE MODEL SATURN I BOOSTER

NASA TM X-53007

by J. B. Gayle and C. H. Blakewood

Unclassified, 41 pages, 5 tables, 21 figures

Multiple tank clusters representing Saturn I boosters and containing 3,500 pounds of LOX/RP-1 were destructed by using internal and external destruct systems. The explosive yields for both systems were low and, therefore, tended to refute the suggestion that the cluster configuration of this vehicle necessarily would result in increased yields by comparison

with vehicles having dual tanks in tandem configuration. Comparisons of results for the two destruct systems indicated somewhat lower yields and less fragmentation for the external destruct system.

February 26, 1964 DESIGN AND DEVELOPMENT OF A NASA TM X-53014
DIFFERENTIAL THERMAL ANALYSIS
APPARATUS

by C. F. Smith

Unclassified, 20 pages, 1 table, 11 figures

An apparatus for making differential thermal analysis determinations on a variety of materials is described. The design criteria and the final design are discussed in detail. The results of the calibration runs and of several selected samples are presented in graphical form.

February 26, 1964 CALCULATION OF CONTACT STRESSES NASA TM X-53015
ON MINIATURE SLIP RINGS FOR
INERTIAL PLATFORMS

by K. E. Demorest, F. G. Albright, and J. C. Horton

Unclassified, 14 pages, 1 table, 4 figures

A method of calculating the unit loading on the contact surfaces of miniature slip rings is presented. The mathematical formulations required are given, and the assumptions on which the calculations are based are discussed in detail. Calculated Hertzian loads for different groove configurations, for slip ring and brush diameters, and for brush preloads are presented in graphical form. These calculations show the contact stress to be greater than the strength of the materials currently used. A corrective program aimed at finding improved material is in progress.

April 6, 1964 SILANE POLYMERS OF DIOLS NASA TM X-53028

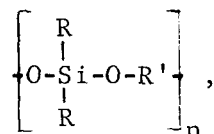
by James E. Curry and James D. Byrd

Unclassified, 27 pages, 4 tables, 7 figures

The purpose of this study was to synthesize and develop a new class of polymers which have improved physical and chemical properties.

Polymers which have useful properties and very good thermal stability

were prepared by combining the thermally stable aromatic rings with the silicon polymer chain. These polymers have the general structure,



where R represents an alkyl or aryl group and R' is an alkyl, aryl substituted alkyl, biphenyl or diphenyl ether linkage.

The polymer showing the best properties is polydiphenylsiloxybiphenyl which is stable to 600°C (1112°F) for short periods of time. It is also reasonably stable when exposed to ultraviolet radiation, has good fiber and film forming properties, and is a good adhesive at ambient temperatures.

May 12, 1964

EVALUATION OF ROYCO MODEL 3300
AUTOMATIC PARTICLE COUNTER FOR
PNEUMATIC SYSTEMS

NASA TM X-53047

by J. O. Romine and J. B. Gayle

Unclassified, 16 pages, 1 table, 6 figures

An experimental evaluation of the Royco Model 3300 gaseous system automatic particle counter has been made. The results indicated that the automatic counts greatly exceeded the corresponding microscopic values for particles less than approximately 10 μ . For particles greater than approximately 20 μ , the results scattered excessively. Although the reasons for these difficulties were not established definitely, it appears that the counter records spurious pulses in the smaller size ranges and that the relatively small sample volume monitored results in excessive scatter for the larger size ranges. Therefore, it is concluded that, in its current state of development, this counter is not adequate for most applications in monitoring particulate contamination in gaseous systems.

May 26, 1964

COMPATIBILITY OF MATERIALS
WITH LIQUID OXYGEN

NASA TM X-53052

by C. F. Key

Unclassified, 34 pages, 7 tables

Tests were made to determine the compatibility of a wide variety of materials with liquid oxygen (LOX). The test method is based upon the tendency of materials to react with LOX on impact; the test instrument is commonly known as the "ABMA Tester."

This report serves as an addendum to a previous report, MTP-P&VE-M-63-14 (same as NASA TM X-985, dated August 1964), "Compatibility of Materials with Liquid Oxygen," and gives results obtained during the past year. Materials tested include lubricants, sealants, insulations, elastomers, gaskets, alloys, and others.

June 19, 1964 PERMEATION OF ADHESIVELY BONDED NASA TM X-53066
JOINTS BY GASEOUS AND LIQUID HYDROGEN

by C. T. Egger, D. A. Nauman, T. J. Carter, and J. B. Gayle

Unclassified, 33 pages, 4 tables, 15 figures

The permeabilities of selected adhesives to gaseous and liquid hydrogen were determined experimentally. Frequent rupture on exposure to liquid hydrogen suggests that for the nonfilleting adhesives bond integrity rather than permeability considerations will limit the utility of adhesive bonds for liquid hydrogen applications. Permeabilities for the filleting adhesives are several orders of magnitude higher and tend to preclude their use for such applications.

June 23, 1964 THE EFFECT OF HYDROCARBON NASA TM X-53070
CONTAMINATION ON THE GAS BEARINGS
USED IN THE SATURN ST-124
GUIDANCE SYSTEM

by A. C. Krupnick

Unclassified, 31 pages, 6 tables, 12 figures

The guidance system (ST-124 platform) in the Saturn V vehicle contains a critical bearing (AB-5) which is "lubricated" by or suspended in gaseous nitrogen to provide an essentially frictionless condition. The extremely close mechanical tolerances between the surfaces make the bearing highly sensitive to trace quantities of oil in the gas. Experimental tests showed that performance is not appreciably affected by very clean gaseous N₂ (less than 0.1 ppm hydrocarbon content). However, at 0.5 ppm hydrocarbon content, performance decays to the malfunction criteria level in approximately 280 hours. Examination of the bearings after test showed that in addition to collection at the inlet filter, oil also was deposited at the plenum inlets and in the flow restrictors.

For applications where the combined checkout on the gas bearings and flight operating times do not exceed 200 hours, the current 0.3 ppm hydrocarbon limit provides an acceptable margin of safety. However, for operational lifetimes greater than 200 hours, the limit should be lowered to 0.2 ppm or better.

July 17, 1964 A SYSTEM FOR MEASURING THERMAL NASA TM X-53090
EXPANSION OF METALLIC AND NON-
METALLIC MATERIALS AT CRYOGENIC
TEMPERATURES

by W. N. Clotfelter and L. A. Soileau

Unclassified, 11 pages, 1 table, 5 figures

This report describes the development of a cryogenic system for measuring thermal expansion. The repeatability of determinations made with this apparatus has been demonstrated.

July 17, 1964 APPARATUS FOR MEASURING NASA TM X-53091
TEMPERATURE DROP ACROSS
AN INTERFACE

by C. F. Smith

Unclassified, 15 pages, 6 tables, 4 figures

The apparatus and techniques used to determine the temperature drop across a bolted interface are described in this report. The parameters studied during this experiment were specimen heat input, interface surface treatment, bolt torque, and vacuum. Determinations were made on aluminum alloys 2024-T4, 6061-T6, and Almag "35" with various finish treatments.

July 23, 1964 INTERCELLULAR MOBILITY OF FLUIDS NASA TM X-53094
WITHIN HONEYCOMB-REINFORCED COMMON
BULKHEADS (BULKHEAD PURGING)

by C. T. Egger, T. J. Carter, and J. B. Gayle

Unclassified, 27 pages, 5 tables, 11 figures

The flow of gases through annular and rectangular face-sealed honeycomb specimens was studied as a function of pressure drop to develop

purging and evacuation procedures for the S-IV vehicle. Extrapolation of steady state results for laboratory specimens to unsteady state conditions for full scale vehicles was accomplished by using an energy/mass transport analogy.

The results indicated that mass transport through the honeycomb is fast enough to cause concern but too slow to permit rapid purging or evacuation. Although purging and evacuation times could be greatly decreased by use of perforated honeycomb core material, this would offset any advantages resulting from confining or isolating individual leaks. Further study of these factors is needed.

August 13, 1964 CROSS CHECK STUDY OF THERMAL- NASA TM X-53106
VACUUM WEIGHT LOSS DETERMINATIONS
FOR SELECTED POLYMERS

by C. T. Egger and J. B. Gayle

Unclassified, 29 pages, 2 tables, 13 figures

Results of a cross check study of the vacuum compatibility of selected polymers are presented. MSFC data for polystyrene and polymethylmethacrylate are compared with results obtained by the National Bureau of Standards. The major finding was that temperature measurement methods are subject to unexpected errors and, thus, require careful evaluation.

August 18, 1964 ELECTRICAL AND INFRARED PROPERTIES NASA TM X-53110
OF GLASSES IN THE SYSTEM $\text{Bi}_2\text{O}_3\text{-TeO}_2$

by Donald R. Ulrich

Unclassified, 11 pages, 2 tables, 1 figure

The region of glass formation in the binary system $\text{TeO}_2\text{-Bi}_2\text{O}_3$ has been defined. The electrical properties (resistance and capacitance) of these glasses, at room temperature and at liquid nitrogen temperatures, and the infrared transmission spectra have been determined.

August 19, 1964 THE KINETICS OF THE SINTERING OF NASA TM X-53111
HOT PRESSED MOLYBDENUM DISULFIDE
AND MOLYBDENUM DISULFIDE-SILVER
COMPOSITIONS AND THE EFFECT ON THE
ELECTRICAL CONDUCTION PROCESSES

by Donald R. Ulrich and Harry M. King

Unclassified, 16 pages, 7 figures

The hot pressing kinetics of molybdenum disulfide and molybdenum disulfide-silver compositions, which are of interest as electrical conductors in a vacuum, have been studied. The rate of sintering is described by the first-order rate equation of Murray et al. as being a molybdenum disulfide controlled plastic flow mechanism. The diffusion of silver is a second process occurring over the temperature range of hot pressing. The electrical conduction mechanism as a function of both composition and fabrication temperature is discussed.

August 20, 1964 METALLURGICAL EVALUATION OF A NEW NASA TM X-53114
ALUMINUM CASTING ALLOY DEVELOPED
FOR SPACE VEHICLE USE AT
CRYOGENIC TEMPERATURES

by P. C. Miller

Unclassified, 34 pages, 6 tables, 19 figures

The mechanical properties of a new aluminum-copper sand casting alloy were determined at temperatures from 26.7°C (80°F) to -252°C (-423°F). The alloy had high ultimate tensile and yield strengths, as compared to commercial high strength aluminum castings, which increased with a decrease in temperature over the spectrum of 26.7°C to -252.7°C. The percent elongation also increased continually down to -252.7°C. In addition, high toughness (as measured by impact strength at ambient and cryogenic temperatures) characterized the castings examined. Weldments of the alloy to itself and to 2219 aluminum alloy plate were also tested. The alloy appears quite promising for cryogenic applications.

September 11, 1964 DEVELOPMENT OF POLYMERIC NASA TM X-53129
MATERIALS FOR POTTING AND
ENCAPSULATION OF ELECTRONIC
ASSEMBLIES

by James E. Curry and William J. Patterson

Unclassified, 30 pages, 9 tables, 2 figures

A development program aimed at improved potting compounds for encapsulating and coating electronic assemblies has been initiated.

The investigation has proceeded in three phases: the first phase involves evaluation of epoxy, silicone, polyester, and polyurethane commercial polymers; the second phase is directed toward chemical and physical modification of promising commercial products; the third phase consists of a synthesis program of epoxy-siloxane and urethane-siloxane polymer systems of high potting compound potential.

September 21, 1964 LOW TEMPERATURE ELASTIC BEHAVIOR NASA TM X-53137
 OF FOURTEEN COMPOUNDED ELASTOMERS

by C. D. Hooper

Unclassified, 44 pages, 3 tables, 19 figures

Fourteen compounded elastomers, each one at three hardness levels, were studied in this investigation. These studies included modulus of rigidity, brittle temperature, Young's modulus at 10,000 psi, and relative stiffness of each compound. Graphical data are presented which illustrate the findings of these experiments.

October 2, 1964 PRELIMINARY INVESTIGATION OF FIRE NASA TM X-53144
 AND EXPLOSION HAZARDS ASSOCIATED
 WITH S-II INSULATION

by C. F. Key and J. B. Gayle

Unclassified, 18 pages, 1 table, 10 figures

The condensation of LOX/LN₂ mixtures within composite insulations, such as that being considered for the S-II vehicle, would be expected to create a fire and explosion hazard in the event of impact, shock, or other stimuli.

To obtain experimental information on this problem, an investigation was made in which small tanks provided with S-II insulation panels were filled with LH₂, held for varying lengths of time, and impacted. The results confirmed the expectation that catastrophic failures could occur under these conditions but suggested that the probability of such failures is low and should be weighed against other factors to determine if modification of the S-II insulation concept is necessary.

October 2, 1964 EVALUATION OF HIGH ACCURACY NASA TM X-53145
 PRODUCTS CORPORATION MODEL PC-202
 AUTOMATIC PARTICLE COUNTER

by J. O. Romine and J. B. Gayle

Unclassified, 20 pages, 3 tables, 5 figures

In a previous investigation, it was shown that the HIAC Model 101 automatic particle counter gave excellent results for laboratory samples. However, marked discrepancies were noted between in-line automatic counter results and those determined microscopically for samples withdrawn from the system through a bleed valve.

To obtain further information on in-line monitoring of particulate contaminant, an improved HIAC counter (Model 202) was used to obtain in-line data for comparison with microscopic results for samples withdrawn from the system through an improved sampling arrangement. The results indicated that with suitable operating procedures the Model 202 counter gives results generally equivalent to those determined microscopically.

October 5, 1964

AN ANALYSIS OF THE VARIATION
IN WEAR LIFE OF HOT PRESSED
MOLYBDENUM DISULFIDE-SILVER
ELECTRICAL CONTACT BRUSHES
IN VACUUM

NASA TM X-53146

by Donald R. Ulrich

Unclassified, 19 pages, 2 tables, 3 figures

Compositions of hot pressed molybdenum disulfide containing metallic additions have shown promise as materials for electrical contact brushes in vacuum; however, the wear life for a given composition has varied from specimen to specimen. The non-reproducibility of these brushes has been analyzed with the major effort being concentrated on a 55.9% MoS₂ - 44.1% Ag (wt) composition. The factors affecting wear duration of both the brush materials and their deposited commutator films have been studied and correlated. An optimum brush composition that should give the best combination of lubrication and electrical conduction properties is defined. The brushes are classified according to their electrical conduction behavior.

October 12, 1964

PRELIMINARY STUDIES OF LIQUID
OXYGEN EXPULSION BLADDERS

NASA TM X-53005

by V. L. Chinberg and H. Perkins

Unclassified, 23 pages, 5 tables, 4 figures

Expulsion bladders for liquid oxygen (LOX) were fabricated from several different materials and evaluated by functional testing. The results indicated that materials considered chemically compatible with liquid oxygen generally are unsuited for fabrication of expulsion bladders because of their mechanical properties at low temperatures. Complex expulsion bladders involving reinforced films and predetermined fold patterns performed slightly better than simple unreinforced films. However, extensive improvement will be necessary before this method of LOX transfer can be utilized in zero-gravity propulsion systems.

October 16, 1964

BIBLIOGRAPHY ON FLUORINE AND
FLUORINE OXYGEN OXIDIZERS FOR
SPACE APPLICATIONS

NASA TM X-53149

by J. H. Cabaniss

Unclassified, 75 pages

This bibliography references approximately 350 reports on fluorine and fluorine-oxygen mixtures (FLOX). In the introduction, current government contracts pertaining to FLOX and fluorine are listed. The bibliography includes separate sections dealing with material compatibility; handling, storage, disposal, and safety considerations; physical and chemical properties; propellant oxidizer studies; vehicle component design studies; and miscellaneous reports.

October 22, 1964

EFFECTS OF NUCLEAR RADIATION
AND CRYOGENIC TEMPERATURES
ON ENGINEERING MATERIALS

NASA TM X-53152

by E. C. McKannan and R. L. Gause

Unclassified, 51 pages, 13 tables, 14 figures

This report evaluates the changes which occur in the physical and mechanical properties of engineering materials during separate and simultaneous exposure to radiation and cryogenic temperatures.

Materials discussed herein are representative of those most likely to be used in nuclear-powered spacecraft and were chosen from the categories of structural adhesives and laminates, thermal and electrical insulations, and thermal control coatings. The responses of these materials to the specified environments are discussed by chemical class, e.g., polyurethanes and epoxies.

November 2, 1964

DESIGN AND DEVELOPMENT OF A
MULTIPLE PORT ULTRA-HIGH
VACUUM SYSTEM

NASA TM X-53155

by J. C. Horton

Unclassified, 31 pages, 12 figures

A multiple port ultra-high vacuum system is described. The performance requirements, the resulting design criteria, and the final configuration are discussed. Theoretical performance is calculated and compared with preliminary performance data.

November 8, 1964

VACUUM SYSTEM SIMULATION AND
MULTI-PORT SYSTEM FEASIBILITY STUDY

NASA TM X-53175

by C. T. Egger and J. B. Gayle

Unclassified

The pumpdown, degassing, and ultimate vacuum characteristics of single and multiport vacuum systems under various operating conditions are compared by means of a mathematical model and electrical analog computer simulation.

Using this technique, it was shown that a large multiport vacuum system employing a large diffusion pump is feasible and affords a number of advantages not attainable in an array of individual single-chamber systems of nominally similar capabilities.

Experimental data for an existing single-chamber laboratory system are in close agreement with performance characteristics predicted by the simulation method.

December 11, 1964

LOW TEMPERATURE MECHANICAL
PROPERTIES OF 8Al-1Mo-1V TITANIUM
ALLOYS AND COMPOSITE WELDMENTS

NASA TM X-53178

by C. R. Denaburg

Unclassified

The mechanical properties of annealed 8Al-1Mo-1V titanium alloy sheet, 0.063 inch thick, were determined at temperatures from ambient to -253°C (-423°F). The alloy had high strength through the entire test temperature range. The tensile strength at -253°C (-423°F) was approximately 75 percent greater than the ambient temperature tensile

strength. The elongation decreased from approximately 16 percent at ambient temperature to approximately 8 percent at -196°C (-320°F) and to less than 3 percent at -253°C (-423°F).

Weldments of 8Al-1Mo-1V titanium to 6Al-4V titanium were made by utilizing the TIG process with 6Al-4V titanium alloy filler. Similar weldments were made with the electron beam process without filler wire. Based upon typical strength values of 6Al-4V titanium alloy, the as-welded joint efficiencies of both types of weldments exceeded 95 percent over the entire range of test temperatures from ambient to -253°C (-423°F). The TIG weldments resulted in slightly higher strengths over the test temperature range except at room temperature, where strengths were approximately equal.

December 16, 1964 STATUS REPORT ON LIQUID OXYGEN NASA TM X-53183
SEAL INVESTIGATION

by J. E. Curry

Unclassified, 39 pages

The purpose of this integrated internal and contracted program is to develop an improved gasket material for liquid oxygen applications. Several proprietary fluorocarbon materials were investigated locally, but no single parameter or relationship could be established as a true index of cryogenic seal performance. Parallel studies by a contractor have resulted in the development of a laminated gasket construction consisting of alternating layers of glass fabric and fluorocarbon film. The material is then compressed and heated to cause partial wetting of the glass fabric by the fluorocarbon resin. The unique properties of these laminates are discussed in detail, and data are presented which indicate an attractive future for these materials as general purpose cryogenic seals.

This program failed completely to establish any margin of superiority on the part of the Allpax 500 product now used for liquid oxygen gasketing over several other products studied.

December 18, 1964 ANISOTROPIC DILATION DURING NASA TM X-53184
ANNEALING OF 18% NICKEL
MARAGING STEEL

by H. H. Kranzlein

Unclassified

The dimensional changes which occurred during annealing and aging of 18% nickel maraging steel sheet and plate were measured to determine the dimensional stability of this alloy. Significant anisotropic dimensional changes were measured during annealing, but only small isotropic shrinkage was observed during aging. Multiple annealing treatments revealed that the anisotropic dimensional changes occurring during annealing were repetitive and cumulative.

Recognition of the anisotropic dimensional changes during annealing is necessary since they are of sufficient magnitude to preclude any re-annealing of precision or dimensionally critical components that are fabricated from 18% nickel maraging steel.

INTERNAL NOTES

February 25, 1964 MECHANICAL PROPERTIES OF HIGH IN-P&VE-M-64-1
STRENGTH A-286 BOLTS AT
CRYOGENIC TEMPERATURES

by J. W. Montano

Unclassified, 17 pages, 4 tables, 6 figures

The mechanical properties of A-286 steel alloy bolts were determined at temperatures from ambient to -423°F (-263°C). The bolts were supplied by two manufacturers. One group of bolts had been cold worked approximately 65% and the other group approximately 50%. Although the bolts which were cold worked 65% had high ultimate strengths, they fractured in tensile tests before a 0.2% yield strength value was reached. The bolts which were cold worked 50% showed superior yield properties, notched tensile strength, and notched/reduced shank ratios.

August 7, 1964 STRESS CORROSION OF ALUMINUM IN-P&VE-M-64-2
ALLOY 2219 PLATE AND FORGING

by T. S. Humphries

Unclassified, 15 pages, 2 tables, 5 figures

The stress corrosion characteristics of 2219 aluminum, a high strength weldable alloy, are presented. A variety of tempers, including T37, T81, T87, T352, and T852, in both plate and forging stock were tested by using the alternate immersion test with a 3-1/2 percent salt solution as the test medium. Studies of butt welded joints of plate to

forging material were included, and various aging treatments were applied. It was found that all aged conditions of plate, forging, and welded combinations tested were resistant to stress corrosion.

September 1, 1964 SHORT-TIME ELEVATED-TEMPERATURE IN-P&VE-M-64-4
 MECHANICAL PROPERTIES OF
 2219-T87 AND 2219-T6
 ALUMINUM ALLOY

by J. W. Montano

Unclassified, 24 pages, 5 tables, 12 figures

The mechanical properties of 2219-T87 and 2219-T6 aluminum were determined after soak times from 0 to 300 seconds at temperatures from 300°F (149°C) to 600°F (316°C). Specimens were tested also at ambient temperatures after a soaking period of 300 seconds at temperatures of 200°F (93°C) to 700°F (371°C). In general, the tensile strength of the 2219 aluminum alloy decreased with increasing temperature. The tensile properties were not significantly influenced by variations in the soak times used through 500°F (260°C). At 600°F (316°C), increasing the soak time slightly affected the strength. For relatively short time exposures, this material can be recommended for load-bearing applications to 400°F (204°C), at which temperature 70% of the ambient temperature strength is still retained.

September 10, 1964 LIQUID PROPELLANT BLAST HAZARDS IN-P&VE-M-64-5

by John B. Gayle

Unclassified, 13 pages

The development of large launch vehicles, particularly those employing new high energy propellant combinations, has resulted in major problems in the siting of test stands and launch pads. A number of investigations are being carried out under the direction of NASA/MSFC to provide comprehensive information regarding the blast hazards of liquid propellants because of the high cost of ground facilities and the limited availability of real estate. These include studies of the explosive characteristics of the propellants themselves, studies of the mixing of cryogenic liquids, studies of the explosive yield from liquid propellants, and a determination of the probability of catastrophic incidents for flight weight vehicles. This paper describes these investigations and summarizes the more important results obtained to date.

November 2, 1964

INVESTIGATION OF A STANNATE
CONVERSION COATING FOR
MAGNESIUM ALLOYS

IN-P&VE-M-64-6

by Jim Lowery

Unclassified, 13 pages, 4 figures

A stannate conversion coating developed for the corrosion protection of magnesium alloys was evaluated by using accelerated corrosion tests. The coating was applied by immersion in a water solution of sodium hydroxide, potassium stannate, sodium acetate, and tetrasodium pyrophosphate. Although the coating provided a moderate amount of protection from a salt spray environment, it generally showed less corrosion resistance than MIL-M-45202 (Dow 17) anodic coating, which was used as a comparison.

November 20, 1964

EVALUATION OF THE BENDIX
PORTABLE HYDROGEN VAPOR
DETECTOR SET

IN-P&VE-M-64-7

by Cortes L. Perry

Unclassified, 15 pages, 5 figures

An instrument developed by the Bendix Corporation for monitoring hydrogen content in air was evaluated for accuracy, stability, and other use factors. In addition to numerous electronic difficulties, the instrument failed to provide reliable results. Considerable drift occurred on continuous operation in a 2.5% hydrogen environment, and low readings were obtained in air contaminated with other gases. Erratic operation of the palladium sensing element was a major problem. Thus, it is recommended that the current Bendix Corporation vapor detector should not be used to monitor hydrogen content.

1964 PUBLICATIONS

by Materials Division

The information in this report has been reviewed for security classification. Review of any information concerning Department of Defense or Atomic Energy Commission programs has been made by the MSFC Security Classification Officer. This report, in its entirety, has been determined to be unclassified.

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